

WHAT IS CLAIMED IS:

1. A multi-junction solar cell, comprising:

a plurality of monolithic cells, each monolithic cell including at least one junction, each of the monolithic cells being bonded to at least one other of the monolithic cells with a direct wafer bond, wherein the direct wafer bond does not include any intervening material between the monolithic cells.

2. The multi-junction solar cell of claim 1, wherein the direct wafer bond is achieved by

bonding forces between dipoles at a surface of a first one of the monolithic cells and a surface of a second one of the monolithic cells.

3. The multi-junction solar cell of claim 1, wherein each of the plurality of monolithic cells has a bandgap that is different from the bandgaps of the other monolithic cells.

4. The multi-junction solar cell of claim 1, wherein the multi-junction solar cell has been

annealed to strengthen the direct wafer bonds between the plurality of monolithic cells.

5. The multi-junction solar cell of claim 1, wherein the multi-junction solar cell includes four junctions.

6. The multi-junction solar cell of claim 1, wherein at least one of the plurality of monolithic cells includes more than one junction.

7. The multi-junction solar cell of claim 1, wherein each of the plurality of monolithic cells was epitaxially grown on separate substrates.
8. The multi-junction solar cell of claim 1, wherein each of the plurality of monolithic cells has a lattice constant that is different than the lattice constants of the other monolithic cells.
9. A multi-junction solar cell comprising:
  - a plurality of constituent cells, each constituent cell including at least one junction,
  - the plurality of constituent cells being joined by direct wafer bonds.
10. The multi-junction solar cell of claim 9, wherein each of the constituent cells is joined to at least one other of the constituent cells by a direct wafer bond, wherein the direct wafer bond includes no intervening material between the joined constituent cells.
11. The multi-junction solar cell of claim 9, wherein each of the plurality of constituent cells is a monolithic cell epitaxially grown on a separate substrate.
12. The multi-junction solar cell of claim 9, wherein the direct wafer bonds are achieved by bonding forces between surfaces of adjoining constituent cells.
13. The multi-junction solar cell of claim 9, wherein at least one of the plurality of constituent cells includes more than one junction.

14. A method for producing a multi-junction solar cell, comprising:
  - providing a plurality of monolithic cells, each monolithic cell having at least one junction; and
  - joining together the plurality of monolithic cells with direct wafer bonds.
15. The method of claim 14, further comprising:
  - smoothing at least one surface of each monolithic cell prior to joining.
16. The method of claim 14, wherein each of the direct wafer bonds does not include any intervening material between surfaces of adjacent monolithic cells.
17. The method of claim 14, wherein each of the direct wafer bonds is achieved by bonding forces between dipoles at a surface of one of the monolithic cells and a surface of another of the monolithic cells.
18. The method of claim 14, wherein at least one of the plurality of monolithic cells includes more than one junction.
19. The method of claim 14, further comprising:
  - annealing the multi-junction solar cell to strengthen the direct wafer bonds.

20. The method of claim 14, wherein each of the plurality of monolithic cells has a bandgap that is different from the bandgaps of the other monolithic cells.